



CITY OF CONCORD
New Hampshire's Main Street™
Community Development Department

REPORT TO THE MAYOR AND CITY COUNCIL

David Cedarholm, PE
City Engineer

FROM: Karen Hill, PE, Transportation Engineer
DATE: March 22, 2021
SUBJECT: Ordinance amending the City Code of Ordinances, Title II, Traffic Code; Schedules V and Va converting the intersection of Bog Road, Carter Hill Road, Horse Hill Road, and River Road from a 2-way STOP to a 4-way STOP.

Recommendation

Accept this report and see the attached amendments calling for added stop controls at the intersection of Bog Road, Carter Hill Road, Horse Hill Road, and River Road and converting the intersection from a 2-way STOP to a 4-way STOP (see map).

Background

Horse Hill Road, River Road, Bog Road and Carter Hill Road all terminate at an intersection near the east end of the Horse Hill Road Bridge over the Contocook River. Currently, Horse Hill and Bog Road are pass-through streets without STOP signs, and both Carter Hill Road and River Road approaches are controlled by STOP signs. Horse Hill Road and Bog Road are classified as collector streets and provide for east-west traffic movement to and from Concord and Hopkinton/Webster. Carter Hill Road is classified as a collector street and River Road is a local road. The posted speed limit for Horse Hill, Bog and Carter Hill Road is 35 mph, and river Road has a posted speed limit of 30 mph. Carter Hill Road and River Road provide north-south connections in the area and to the local orchard and nursery.

The intersection was overlaid in 2020 when Bog Road was repaved improving the pavement condition at the intersection. A sidewalk is located along the southerly side of the Horse Hill Road Bridge and wraps around the corner, terminating on the westerly side of Carter Hill Road at the River Hill Market parking lot. There are no crosswalks at the intersection. There is an overhead street light located on the southwest corner of the intersection.

This report has been prepared in response to a City Council referral related to citizen concerns about the intersection, and additional issues brought forward at the June 25, 2020 Transportation Policy Advisory Committee (TPAC) meeting about the intersection's skewed geometry and sight distance challenges. The repaving of Bog Road in the spring of 2020 appears to have resulted in an increase in traffic volumes and higher speeds of vehicles

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approaching the intersection from Bog Road, which triggered the inquiry. TPAC remanded the issue to the Traffic Operations Committee (TOC) for evaluation.

Discussion

The safety assessment of this intersection considered two primary safety factors in accordance with the guidance for multi-way stops in the Manual on Uniform Traffic Control Devices (MUTCD) for streets and highways to warrant conversion from a 2-way STOP to a 4-way STOP:

- Traffic volumes and vehicle speeds approaching the intersection; and,
- The geometry and physical characteristics of the intersection

Traffic Volumes and Speeds

To evaluate the traffic volumes and speeds at the intersection, the Engineering Services Division worked with the Central New Hampshire Regional Planning Commission (CNHRPC) staff who conducted traffic volume and speed counts at the intersection approaches in June-August 2020. During the time period Horse Hill Road had about 2,814 vehicles per day (vpd) and Bog Road had about 2,914 vpd, Carter Hill Road had about 2,832 vpd, and River Road has about 1,860 vpd. Recorded traffic speeds along Horse Hill Road west of the intersection indicated average speeds ranging from 29 to 33 mph with 85th percentile speeds ranging from 33 to 37 mph.

The MUTCD Multi-way Stop Guidance (Section 2B.07) recommends the following:

“Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.”

Based on the above traffic volumes, the approaching traffic volumes are approximately equal, with an exception of River Road, which is approximately 1,000 vehicles less per day than the other three approaches. This would suggest a 4-way stop might be warranted.

Minimum volumes:

- *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day.*
- *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour.*

The average number of vehicles, pedestrians, and bicycles per hour approaching the intersection falls short of the minimum criteria to warrant a 4-way STOP.

- *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph.*

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The 85th percentile speed for Horse Hill Road ranges from 33 to 37 mph, which is below the minimum speed criteria to warrant a 4-way STOP.

Conflicts and Physical Constraints

Regarding vehicle crashes and conflicts, the MUTCD recommends the following criteria:

- *Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*

Reported accidents at the intersection average one crash per year. There were two crashes in 2019 and 2016. However, the following additional criteria should also be considered:

- *The need to control left-turn conflicts;*
- *The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;*

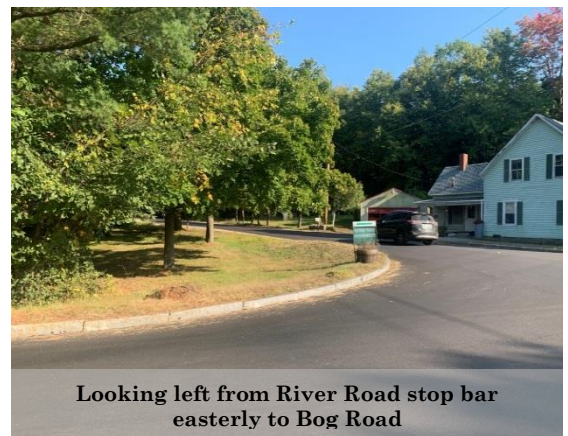
Pedestrian volumes are not high, but the City has received citizen complaints about unsafe crossing conditions and the desire for safer pedestrian access to the River Hill Market.

- *Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and*

Intersection sight distance (ISD) at the Carter Hill and River Road approaches is a major concern due to the poor geometry of the intersection and multiple physical constraints. The required ISD for 35 mph is 390', which the existing conditions fall far short of. The railings on the Horse Hill Road Bridge create a significant visual barrier for vehicles stopped at Carter Hill and River Roads. The vertical difference of the bridge to the intersection and the skewness of the intersecting roadways further diminishes the ability to see the Horse Hill Road and Bog Road vehicles approaching intersection from the STOP signs at both Carter Hill and River Roads. Vehicles from Carter Hill and River Roads tend to "inch out" almost a full car length past the stop bars in order to see oncoming traffic resulting in them encroaching into the travel way of the oncoming traffic on Horse Hill and Bog Roads, which are not required to stop. Conflicts are also known to arise due to the expectation of drivers approaching from Carter Hill and River Roads that the intersection is already a 4-way stop, and they become surprised when vehicles approaching from Horse Hill and Bog Road do not stop.

(See supporting photos below)

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- *An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.*

Traffic volumes on the Carter Hill approach are similar to Horse Hill and Bog Road volumes, introducing conflicts at the intersection. The peak hour volume of vehicles entering the intersection is actually highest on the Carter Hill Road approach.

- *Other physical considerations*

The River Hill Market is located on the south westerly corner of the intersection. Currently, there are 4 parking spaces in the front of the building where vehicles frequently back out into the roadway very near to the intersection. This creates conflicts with fast moving vehicles making a right turn from Horse Hill onto Carter Hill.

(See supporting photo below)

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Conclusion

The results of this assessment were discussed at the September 22, 2020 TOC meeting. After discussions, the TOC members were evenly divided in their support of making the intersection a 4-way STOP. Some members were not in favor of installing a 4-way STOP because the minimum accident and traffic volume data did not appear to satisfy the MUTCD warrant requirements. Other TOC members were in favor of converting the intersection to a 4-way STOP to help mitigate the significant sight distance issues and physical constraints that regularly cause conflicts and frequent “near misses” at the intersection.

Reasons to Install

- Recent Bog Road repaving, resulting in higher speeds
- Mitigate intersection sight distance issues
- Address issues with the skewed geometry of the intersection
- Increase in traffic on Carter Hill Road
- River Hill Market parking proximity
- Improve pedestrian safety

Reasons to Not Install

- Minimal number of accidents
- Relatively light traffic volume
- Difficulty stopping on icy bridge in winter
- Will require public to be re-educated on the intersection
- Drivers familiar with the intersection today are courteous and use caution

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After careful consideration of all the factors involved in this assessment, the Engineering Services Division of the Community Development Department recommends that City Council amend the City's Stop Intersection Ordinance (TITLE II - TRAFFIC CODE, Parking Schedules V and Va) see the attached ordinance amendment that would convert this intersection from a 2-way STOP to a 4-way STOP.

KMH/kmh/dc

w/att: Ordinance
Location Map

cc: Thomas J. Aspell, Jr., City Manager
Carlos P. Baía, Deputy City Manager for Development